and 10 : The effects of the addition of a second rare earth element other than samarium)

Commercial powder of Y_2O_3, La_2O_3 ,CeO_2 , Gd_2O_3, Dy_2O_3 , Er_2O_3 , or Yb_2O_3 (each powder has a purity of not lower than 99.9 percent and a mean particle diameter of not higher than 2 μm) was used as a source of second rare earth element. The above reduction nitriding powder "B" was used as AlN powder. Sm_2O_3 powder used was the same as that in the experiment "A".

Each powder was weighed according to the compositions shown in Table 8, and then each raw mixed powder was produced, shaped and sintered to obtain each sintered body, which was then evaluated, according to the same procedure in the experiment "A". The molar ratios of AlN powder, Sm2O3 powder and powder of the second rare earth oxide were calculated ignoring the content of impurities. Table 8 also shows each sintering temperature.

The basic compositions of AlN and Sm2O3 and the sintering condition in the examples 22 to 25 and 27 to 33 were the same as those in the example 6. The basic compositions and sintering condition in the example 26 were the same as those in the example 7. That is, each second rare earth element was added to the formulation of each example 6 or 7 and sintered under the same condition to provide the sintering body of each of the examples 22 to 33. Table 8 also shows the compositions (chemical analysis data) of the sintering body of each example.

Table 8

	composition of raw powder				sintering condition	properties of sintered body (composition)			
	AlN	Sm_2O_3	complex additive			chemical analysis data (weight%)			
	mol%	mol%	type	content mol%	sintering temperature ℃	O content	Sm content	content of second rare earth element	carbon content
example 22	99.832	0.117	Yb_2O_3	0.050	1750	0.94	0.57	0.40	0.031
example 23	99.832	0.117	Yb_2O_3	0.050	1800	0.90	0.59	0.41	0.030
example 24	99.870	0.117	CeO_2	0.012	1800	0.92	0.63	0.042	0.029
example 25	99.782	0.117	CeO_2	0.100	1800	1.05	0.59	0.32	0.029
example 26	99.666	0.234	CeO_2	0.100	1850	1.06	1.19	0.33	0.028
example 27	99.832	0.117	Y_2O_3	0.051	1800	0.89	0.59	0.21	0.029
example 28	99.866	0.117	La_2O_3	0.017	1800	0.89	0.60	0.10	0.030
example 29	99.833	0.117	Gd_2O_3	0.050	1800	0.91	0.62	0.37	0.030
example 30	99.832	0.117	Dy_2O_3	0.050	1750	0.93	0.60	0.38	0.031
example 31	99.832	0.117	Dy_2O_3	0.050	1800	0.84	0.55	0.35	0.029
example 32	99.833	0.117	Er_2O_3	0.050	1750	0.93	0.61	0.40	0.031
example 33	99.833	0.117	Er_2O_3	0.050	1800	0.87	0.58	0.39	0.030
comparative example 9	99.650	0.117	CeO_2	0.233	1800	1.150	0.660	0.770	0.029
comparative example 10	99.184	0.117	CeO_2	0.699	1800	1.490	0.720	2.290	0.031

Table 9

	Sm2O3 converted content mol%	converted content of second rare earth oxide mol%	Al2O3 converted content mol%	AlN mol%	Sm2O3/ Al2 O3 molar ratio	oxide of second rare earth element / Sm2O3, molar ratio	oxides of all the rare earth elements / Al2O3 molar ratio
example 22	0.079	0.048	0.691	99.181	0.11	0.61	0.18
example 23	0.082	0.050	0.652	99.216	0.13	0.60	0.20
example 24	0.087	0.013	0.704	99.197	0.12	0.14	0.14
example 25	0.082	0.096	0.769	99.053	0.11	1.16	0.23
example 26	0.166	0.099	0.696	99.038	0.24	0.60	0.38
example 27	0.082	0.049	0.643	99.226	0.13	0.60	0.20
example 28	0.083	0.015	0.675	99.227	0.12	0.18	0.15
example 29	0.086	0.049	0.657	99.207	0.13	0.57	0.21
example 30	0.083	0.049	0.678	99.190	0.12	0.59	0.20
example 31	0.076	0.045	0.609	99.269	0.13	0.59	0.20
example 32	0.085	0.050	0.676	99.189	0.13	0.59	0.20
example 33	0.081	0.049	0.628	99.243	0.13	0.60	0.21
comparative example 9	0.092	0.231	0.761	98.916	0.12	2.50	0.42
comparative example 10	0.102	0.698	0.758	98.443	0.13	6.83	1.06